

Serial No.: 10/686,175
Office Action Date: 3/23/2005

Filed: 10/14/2003
Amendment Date: 6/15/2005

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Amendments to the Specification:

Please replace paragraph [0001] with the following amended paragraph:

[0001] This patent application is related to commonly assigned, co-pending U.S. patent application Serial No. 10/686,015 ~~____~~ (Attorney Docket GP-304211).

Please replace paragraph [0048] with the following amended paragraph:

[0048] Referring again to FIG. 4, method 100 continues with the step of comparing 300 an actual value of at least one state parameter 130 of ESS 20 that is indicative of the availability of ESS 20 for implementing silent mode 110 to at least one silent mode initiation limit value 135 associated with the actual value 130, wherein if the actual value of the at least one state parameter 130 compared to the associated at least one mode initiation limit value 135 indicates that silent mode 110 is allowed, method 100 proceeds to the next step, and wherein if the actual value of the at least one state parameter 130 indicates that silent mode 110 is not allowed, this test is repeated so long as silent mode initiation request 120 is being transmitted to silent mode controller 125. As described above, state parameters of the ESS, such as battery or BPM 21, may comprise any parameters that are indicative of the availability of the ESS for use generally, and particularly for use in conjunction with implementation of silent mode 110, including parameters that provide information about either the short-term or long-term characteristics or condition of the ESS. These include the instantaneous battery temperature (T_{BAT}), the battery SOC and the average amp-hour per hour throughput of the battery (AH/H). The T_{BAT} is an important parameter because both charging and discharging of the battery increase the battery temperature (e.g. Under most conditions charging has the greater effect on temperature, but discharging also increases the battery temperature). As the

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battery temperature increases, the charging and discharging efficiency and the ability to obtain and maintain a desired SOC is affected. Further, overheating of the battery can also reduce its service life and available total amp-hour/hour throughput. The battery SOC is an important parameter because it provides an important indication of the total energy available in the battery, and its ability to provide charge to or accept charge from DPIM 19 and the other components of EVT 11. SOC is also important because high and low SOC conditions are associated with overvoltage and undervoltage conditions, respectively, both of which can damage the battery and reduce its service life. The integrated amp-hour/hour throughput is an important parameter because it is known to be directly related to the operational service life of the battery. The amp-hour per hour throughput of the ESS may be measured by integrating the ESS current over time using a predetermined filter and algorithm. Further details regarding amp-hour per hour throughput can be found in commonly assigned, co-pending U.S. provisional patent application Serial No. 60/511,456 ~~—/—~~ (Attorney Docket No. GP-304118), which is hereby incorporated herein by reference in its entirety. In a preferred embodiment, this step comprises comparing $300 T_{BAT}$ to a silent mode initiation battery temperature limit value 135, wherein if T_{BAT} is less than the mode initiation battery temperature limit value (T_{SMI}), the method proceeds to step (3), and wherein if $T_{BAT} \geq T_{SMI}$, this step is repeated so long as silent mode initiation request 120 is being transmitted.

Please replace paragraph [0049] with the following amended paragraph:

[0049] Where ESS comprises a battery, if $T_{BAT} \leq T_{SMI}$, method 100 preferably also comprises a step (2A) of precharging 350 the battery 21 prior to initiation of silent mode 110. This is preferred in order to ensure that battery 21 has an SOC that is sufficient to supply the quantity of electrical energy necessary to implement method 100, as described herein. It is also preferred when precharging 350 that

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this step be limited to precharging the ESS to a state of charge (SOC) value that is less than or equal to a target precharge SOC limit 165. The purpose of this SOC precharging limit is to limit the temperature increase in the battery associated with charging. Another purpose of the upper precharging SOC limit is to make for consistent charge times and to ensure that enough energy is in the ESS while not unnecessarily increasing the AH/H throughput or SOC swing of the ESS by driving the SOC higher than necessary to travel the target distance. There are also life considerations with how much and how quickly the SOC swings from minimum to maximum. One purpose behind the maximum SOC precharge limit is to keep the SOC high enough that if the silent mode uses the entire allocated budget, the minimum limit would not be exceeded. Because precharging 350 is done in anticipation of an immediate and possibly extended discharge from battery as silent mode 110 is initiated, and because discharge also causes additional heating of the battery, it is preferred that precharging be limited to an SOC that is less than or equal to target precharge SOC limit 165. The target precharge SOC limit 165 will necessarily vary depending on the capacity, construction and configuration of battery 21 and other system design factors such the maximum battery power requirements associated with projected vehicle loads, target zone parameters and other factors, and may be expressed as a target value, minimum/maximum value or other similar method of identifying a limit value. For example, in one embodiment associated with BPM 21, where the length of the target zone was about 2.2 km, and the battery had a total capacity (SOC_{100%}) of about 19 amp-hours, the target precharge SOC limit 165 was about 60%, or 11.4 amp-hours. When the SOC of battery 21 reaches target precharge SOC limit 165, precharging 350 is complete and silent mode controller 125 stops precharging 350. Precharging 350 is also preferably terminated if silent mode 110 is initiated prior to the battery SOC reaching target precharge SOC limit 165. It is preferred that precharging 350 comprises charging ESS 20 at a maximum charging power of the vehicle consistent with control of parametric ESS limits associated with ESS charge/discharge, SOC and temperature, such as those described in

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commonly assigned, co-pending US patent application Serial No. 60/511,456
—/—(Attorney Docket No. GP-304118). Further, during precharging 350 the vehicle is adapted to operate engine 145 at a combination of Ni and Ti that maximizes the charging power available to the ESS and which are generally consistent with other system requirements, such as the desired No and To. However, the step of precharging 350 may be adapted to select combinations of Ni and Ti that preferentially maximize the charge power to the ESS, even though such choices may constrain the possible values of No and To to values that are less than desired or commanded values. The method of determining combinations of Ni and Ti to affect the desired control of the EVT powertrain are described in commonly assigned, co-pending US patent application Serial Nos. 10/686,508
—/—(Attorney Docket No. GP-304193) and 10/686,034 (Attorney Docket No. GP-304194), which are hereby incorporated herein by reference in their entirety. When the desired target precharge SOC is reached during precharging 350, charging is preferably stopped and is not resumed unless vehicle operation requires a discharge that causes the SOC to drop below the target precharge SOC. Precharging 350 may also be scheduled for a particular duration of time, subject to parametric limits as described herein. The step of precharging 350 is preferred, but optional and not essential to the practice of method 100, since ESS 20 may comprise more than battery 21, as explained above, and because even when ESS consists of a battery, the control algorithms concerning SOC may be such that precharging 350 is not required prior to implementing method, such as HEVs in which other constraints require that the SOC always be maintained at a level that is sufficient to implement silent mode 110 without the need for precharging.